

REMARKS

Applicants' attorney wishes to thank the Examiner and his primary for the courteous and helpful interview of November 21, 2002 where the present amendment was discussed..

The specification, as previously amended, as now believed to be acceptable.

Only one claim exists in this application, Claim 14, which has been amended to clarify the same. Claim 14, as now amended, is to a semiconductor device that has a semiconductor chip, a tape mounting the semiconductor chip thereon, an adhesive resin layer interposed between the semiconductor chip and the tape, and solder balls arranged on the tape. The tape is restricted to one that has no artificially produced vapor escape holes formed therein, and is of a material that has a high water permeability of $10 \text{ g/m}^2 \cdot 24\text{H}$ or more, sufficient to prevent cracking and bulging of the semiconductor device which might occur when the solder balls are reflowed after the semiconductor device absorbs moisture.

There is support for this claim in the specification and the arrangement claimed is not taught or suggested in the prior art.

Reconsideration and removal of the rejection of Claim 14 under 35 U.S.C. §112, first paragraph, is respectfully requested in view of the following remarks.

Applicants' claim is not to a semiconductor device that has a tape that refuses to allow escape of vapor therefrom, but rather is to a tape that is of a specific material with a high permeability that has no vapor escape holes formed in the tape, i.e., the material itself allows permeability of water vapor without the need for the semiconductor maker to form holes in the tape to allow escape of vapor.

- I. The Office Action refers to the specification at page 3, lines 29-30 and page 4, lines 1-2.
- 1) At page 3, lines 29-30 it is stated: "In this arrangement having at least one hole formed in the tape, ..." (emphasis added), which refers back to the embodiment in the previous paragraph where the method provides that semiconductor chip is fixed to the tape by the adhesive resin layer, and "... forming at least one hole in the tape after the step of fixing the semiconductor chip to the tape by the adhesive resin layer."
 - 2) At page 4, lines 1-2, it is explained that formation of such a hole provides a hole that "thus effectively functions as a vapor escape hole."

This is correct and refers to the first three embodiments of the present invention that are described in detail on pages 7 to 13 of the specification and explained in Figures 1-6. In these embodiments at least one vapor escape hole 32 is formed, after the semiconductor device 10 is formed, so as to extend through the tape 14.

Other embodiments of the present invention are shown and described, however, in the specification and drawings. Beginning at the last paragraph on page 13, fourth to sixth embodiments are clearly described with reference to Figures 7-9 where no vapor escape holes 32 are formed in the tape 14.

As clearly provided in the specification at page 5, line 30 to page 6, line 11:

Further, the semiconductor device according to the present invention comprises a semiconductor chip, a tape for mounting the semiconductor chip thereto, an adhesive resin layer interposed between the semiconductor chip and the tape, and solder balls arranged on the tape, characterized in that the tape is made of a material having high water permeability to prevent package cracking and bulging which otherwise might be caused when the solder balls are reflowed after the semiconductor device absorbs moisture.

In this arrangement, since the tape is made of a material having high water permeability, the moisture contained in the semiconductor device escapes from the tape thereby to prevent the semiconductor device from developing cracking or bulging at the time of solder ball reflow, similar to the above-mentioned case where the tape has at least one hole.

Further, in the embodiment of Figure 7, described in the specification, it is clearly stated at page 14, lines 8-22:

In this embodiment, the vapor escape holes 32 are not formed unlike the embodiment shown in Fig. 1, but instead, the TAB tape 14 is made of polyimide having high water permeability (water vapor permeability) in order to prevent the cracking and bulging of the semiconductor device which otherwise might occur when the solder is reflowed after the device absorbs moisture. Preferably, the TAB tape 14 is made of polyimide resin having water permeability of not less than $10 \text{ g/m}^2 \cdot 24\text{H}$. In this way, it is possible to provide the polyimide base material with a similar effect to that of the vapor escape holes 32 of the embodiment shown in Fig. 1, by using polyimide having high water permeability as the base film of the TAB tape 14. It is thus possible to produce a tape-type BGA or CSP package well resistant to the reflowing.

The language of Claim 14 is not as stated in the "Response to Amendment" section of the Office Action that the "tape has no vapor escape holes" but that the "tape has no vapor escape holes formed therein" (emphasis added).

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The Office Action has concentrated on language referring to embodiments 1-3 of the specification (Figures 1-6) while ignoring the language referring to embodiments 4-6 (Figures 7-9).

In an effort to further clarify the invention, Applicants would propose to amend Claim 14 to provide that no "artificially produced" vapor escape holes are formed in the tape, as provided herein.

With respect to the previous prior art rejection based on Wilson et al., Applicants repeat the arguments presented in the amendment filed July 7, 2002 distinguishing thereover based upon the Wislon et al. tape having vent holes (16) formed therein.

In conclusion, Applicants specification and drawings clearly provide support for Claim 14 and no new matter if present in the claim.

In view of the present amendment to Claim 14 and the above remarks, Applicants claim is believed to be allowable.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

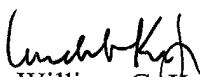
Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

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In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made
Petition for one-month Extension of Time

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VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/836,182

IN THE CLAIMS:

Please amend Claim 14, as follows:

14. (Four Times Amended) A semiconductor device comprising a semiconductor chip, a tape for mounting said semiconductor chip thereto, an adhesive resin layer interposed between said semiconductor chip and said tape, and solder balls arranged on said tape, characterized in that said tape has no artificially produced vapor escape holes formed therein, and is of a material having high water permeability of $10 \text{ g/m}^2 \cdot 24\text{H}$ or more, sufficient to prevent cracking and bulging of said semiconductor device which might occur when the solder balls are reflowed after said semiconductor device absorbs moisture.